

See "Instructions for Filling out the Work Permit" contained in the Work Planning and Control for Experiments and Operations Subject Area.

1. Work request WCC fills out this section.

☐ Standing Work Permit

Requester: Don Lynch	Date:	Ext.: 2253	Dept/Div/Group: PO/PHENIX
Other Contact person (if different from requester): Carter Biggs			Ext.: 7515
Work Control Coordinator: Don Lynch		Start Date: 09/07/2012	Est. End Date: 12/01/2012
Brief Description of Work:			
Building: 1008	Room: PHENIX IR, AH	Equipment: VTX/FVTX Coolant System	Service Provider PHENIX Support Staff

2. WCC, Requester/Designee, Service Provider, and ESS&H (as necessary) fill out this section or attach analysis

ESS&H ANALYSIS			
Radiation Concerns	<input checked="" type="checkbox"/> None	<input type="checkbox"/> Activation	<input type="checkbox"/> Airborne
	<input type="checkbox"/> Contamination	<input type="checkbox"/> Radiation	<input type="checkbox"/> NORM
	<input type="checkbox"/> Other		
<input type="checkbox"/> Special nuclear materials involved, notify Isotope Special Materials Group			
<input type="checkbox"/> Fissionable/Radiological materials involved, notify Laboratory Nuclear Safety Officer			
Radiation Generating Devices:	<input type="checkbox"/> Radiography	<input type="checkbox"/> Moisture Density Gauges	<input type="checkbox"/> Soil Density Gauges
	<input type="checkbox"/> X-ray Equipment		
Safety and Security Concerns	<input checked="" type="checkbox"/> None	<input type="checkbox"/> Explosives	<input type="checkbox"/> Transport of Haz/Rad Material
	<input type="checkbox"/> Pressurized Systems		
<input type="checkbox"/> Adding/Removing Walls or Roofs	<input type="checkbox"/> Critical Lift	<input type="checkbox"/> Fumes/Mist/Dust*	<input type="checkbox"/> Magnetic Fields*
<input type="checkbox"/> Asbestos*	<input type="checkbox"/> Cryogenic	<input type="checkbox"/> Heat/Cold Stress	<input type="checkbox"/> Nanomaterials/particles*
<input type="checkbox"/> Beryllium*	<input type="checkbox"/> Electrical	<input type="checkbox"/> Hydraulic	<input type="checkbox"/> Noise*
<input type="checkbox"/> Biohazard*	<input type="checkbox"/> Elevated Work	<input type="checkbox"/> Lasers*	<input type="checkbox"/> Non-ionizing Radiation*
<input type="checkbox"/> Chemicals/Corrosives*	<input type="checkbox"/> Excavation	<input type="checkbox"/> Lead*	<input type="checkbox"/> Oxygen Deficiency*
<input type="checkbox"/> Confined Space*	<input type="checkbox"/> Ergonomics*	<input type="checkbox"/> Material Handling	<input type="checkbox"/> Penetrating Fire Walls
<input type="checkbox"/> Vacuum			
* Safety Health Rep. Review Required	<input type="checkbox"/> Haz, Rad, Bio Material Exceed DOE 151.1-C Levels - Contact OEM	<input type="checkbox"/> Other	
Environmental Concerns			
<input type="checkbox"/> Atmospheric Discharges (rad/non-rad)	<input checked="" type="checkbox"/> None	<input type="checkbox"/> Work impacts Environmental Permit No.	
<input type="checkbox"/> Chemical or Rad Material Storage or Use	<input type="checkbox"/> Land Use Institutional Controls	<input type="checkbox"/> Soil Activation/contamination	<input type="checkbox"/> Waste-Mixed
<input type="checkbox"/> Cesspools (UIC)	<input type="checkbox"/> Liquid Discharges	<input type="checkbox"/> Waste-Clean	<input type="checkbox"/> Waste-Radioactive
<input type="checkbox"/> High water/power consumption	<input type="checkbox"/> Oil/PCB Management	<input type="checkbox"/> Waste-Hazardous	<input type="checkbox"/> Waste-Regulated Medical
<input type="checkbox"/> Spill potential	<input type="checkbox"/> Waste-Industrial	<input type="checkbox"/> Underground Duct/Piping	<input type="checkbox"/> Other
Waste disposition by:			
Pollution Prevention (P2)/Waste Minimization Opportunity:			
<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes			
FACILITY CONCERNS			
<input checked="" type="checkbox"/> None	<input type="checkbox"/> Intermittent Energy Release		
<input type="checkbox"/> Access/Egress Limitations	<input type="checkbox"/> Electrical Noise	<input type="checkbox"/> Potential to Cause a False Alarm	<input type="checkbox"/> Vibrations
	<input type="checkbox"/> Impacts Facility Use Agreement	<input type="checkbox"/> Temperature Change	<input type="checkbox"/> Other
<input type="checkbox"/> Configuration Management	<input type="checkbox"/> Maintenance Work on Ventilation Systems	<input type="checkbox"/> Utility Interruptions	
WORK CONTROLS			
Work Practices			
<input type="checkbox"/> None	<input type="checkbox"/> Exhaust Ventilation	<input type="checkbox"/> Lockout/Tagout	<input type="checkbox"/> Spill Containment
	<input type="checkbox"/> Security (see Instruction Sheet)		
<input checked="" type="checkbox"/> Back-up Person/Watch	<input type="checkbox"/> HP Coverage	<input type="checkbox"/> Posting/Warning Signs	<input type="checkbox"/> Time Limitation
	<input type="checkbox"/> Other		
<input type="checkbox"/> Barricades	<input type="checkbox"/> IH Survey	<input type="checkbox"/> Scaffolding-requires inspection	<input type="checkbox"/> Warning Alarm (i.e. "high level")
	<input type="checkbox"/> Electrical Inspection Required		
Personal Protective Equipment			
<input type="checkbox"/> None	<input type="checkbox"/> Ear Plugs	<input checked="" type="checkbox"/> Gloves as appropriate	<input type="checkbox"/> Lab Coat
	<input type="checkbox"/> Safety Glasses as appropriate		
<input type="checkbox"/> Coveralls	<input type="checkbox"/> Ear Muffs	<input type="checkbox"/> Goggles	<input type="checkbox"/> Respirator*
	<input type="checkbox"/> Safety Harness		
<input type="checkbox"/> Disposable Clothing	<input type="checkbox"/> Face Shield	<input type="checkbox"/> Hard Hat	<input type="checkbox"/> Shoe Covers
	<input checked="" type="checkbox"/> Safety Shoes	<input type="checkbox"/> High visibility cloths/vest	<input type="checkbox"/> Other
Permits Required (Permits must be valid when job is scheduled.)			
<input checked="" type="checkbox"/> None	<input type="checkbox"/> Cutting/Welding	<input type="checkbox"/> Impair Fire Protection Systems	
<input type="checkbox"/> Concrete/Masonry Penetration	<input type="checkbox"/> Digging/Core Drilling	<input type="checkbox"/> Rad Work Permit-RWP No	
<input type="checkbox"/> Confined Space Entry	<input type="checkbox"/> Electrical Working Hot	<input type="checkbox"/> Other	
Dosimetry/Monitoring			
<input checked="" type="checkbox"/> None	<input type="checkbox"/> Heat Stress Monitor	<input type="checkbox"/> Real Time Monitor	<input type="checkbox"/> TLD for work in tunnels
<input type="checkbox"/> Air Effluent	<input type="checkbox"/> Noise Survey/Dosimeter	<input type="checkbox"/> Self-reading Pencil Dosimeter	<input type="checkbox"/> Waste Characterization
<input type="checkbox"/> Ground Water	<input type="checkbox"/> O ₂ /Combustible Gas	<input type="checkbox"/> Self-reading Digital Dosimeter	<input type="checkbox"/> Other
<input type="checkbox"/> Liquid Effluent	<input type="checkbox"/> Passive Vapor Monitor	<input type="checkbox"/> Sorbent Tube/Filter Pump	
Training Requirements (List specific training requirements)			
CA User or CA Access & PHENIX Awareness, Other skills training as appropriate			
Based on analysis above, the Review Team determines the risk, complexity, and coordination ratings below:		If using the permit when all hazard ratings are low, only the following need to sign: (Although allowed, there is no need to use back of form)	
ESS&H Risk Level:	<input checked="" type="checkbox"/> Low <input type="checkbox"/> Moderate <input type="checkbox"/> High	WCC:	Date:
Complexity Level:	<input checked="" type="checkbox"/> Low <input type="checkbox"/> Moderate <input type="checkbox"/> High	Service Provider:	Date:
Work Coordination:	<input checked="" type="checkbox"/> Low <input type="checkbox"/> Moderate <input type="checkbox"/> High	Authorization to start	Date:
(Department/Division, or their equivalent, Sup/WCC/Designee)			

3. Both work requester and service provider contribute to work plan (use attachments for detailed plans)

Work Plan (procedures, timing, equipment, scheduling, coordination, notifications, and personnel availability need to be addressed in adequate detail):
See Attached

Special Working Conditions Required (e.g., Industrial Hygiene hold points or other monitoring)

None

Notifications to operations and Operational Limits Requirements: None

Post Work Testing, Notification or Documentation Required:

Job Safety Analysis Required: ☐ Yes ☒ No

Review Done: ☒ in series ☐ team

Reviewed by: * Primary Reviewer signature means that the Review Team members were appropriate for the work that was planned, the Team visited the job site, hazards and risks that could impact ESS&H have been considered and controls established according to BNL requirements. In addition, this signature indicates that applicable JRAs, FRAs, as well as other planning documents have been reviewed and training requirements have been identified and recorded on this permit.

Title	Name (print)	Signature	Life #	Date
ES&H Professional				
F&O Facility Project Manager				
Service Provider				
Work Control Coordinator	Don Lynch		20146	
Safety Health Representative				
Research Space Manager				
Other				
Other (PHENIX Escort)				
Required Walkdown Completed				
*Primary Reviewer				

4. Job site personnel (Supervisor and workers) fill out this section.

Note: Signature indicates personnel performing work have read and understand the hazards and permit requirements (including any attachments) and all training required for this permit is current/complete. Job Supervisor/Contractor Supervisor signatures also includes verification that worker training required for this permit is current/complete.

Job Supervisor:		Contractor Supervisor:	
Workers:	Life#:	Workers :	Life#:

Workers are encouraged to provide feedback on ESS&H concerns or on ideas for improved job work flow. Use feedback form or space below.

5. Department/Division, or their equivalent, Line Manager or Designee

Conditions are appropriate to start work: (Permit has been reviewed, work controls are in place and site is ready for job.)

Name:	Signature:	Life#:	Date:
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6. Worker provides feedback.

Worker Feedback (use attached sheets as necessary)

a) WCM/WCC: Are there any changes as a result of worker feedback? ☐ Yes ☐ No

Note: See Work Planning and Control for Experiments and Operations Subject Area section 2.6.

7. Post Job Review/Closeout: Work Control Coordinator (authorizing dept.) checks quality of completed permit and ensures the work site is left in an acceptable condition. (WCC can delegate clean up of job site to work supervisor.) The WCC ensures that the change process to update drawings, placards, postings, procedures, etc., is initiated, if necessary.

Name:	Signature:	Life#:	Date:
Comments:			

VTXFVTX Coolant Piping Upgrade

INTRODUCTION

The VTX and FVTX PHENIX detector subsystems share a common support structure and cooling system which has been operating for several years with NOVEC 7200 as the coolant. The current system employs chillers, filters and a closed system with stainless steel piping. At the detectors, flow meters and TYGON tubing are used to distribute and apportion the coolant to the various internal cooling flow passages.

The system as currently configured operates at the limit of its capacity. In order to reduce restrictions within the piping system and accordingly increase the overall flow in the system thereby increasing all local flows within the detector, The following steps have been proposed:

- Decrease the inertial pressure losses by reducing the number of fittings and bends
- Decrease frictional losses by reducing piping lengths
- Reduce the lengths of flexible lines
- Improve the manifolding at the detector.

In addition, more instrumentation on both the chilled water and coolant sides of the chillers are to be added to improve fault reliability of operation and detection of abnormal conditions.

It is planned to upgrade the existing cooling system to this improved system design during the 2012 summer shutdown.

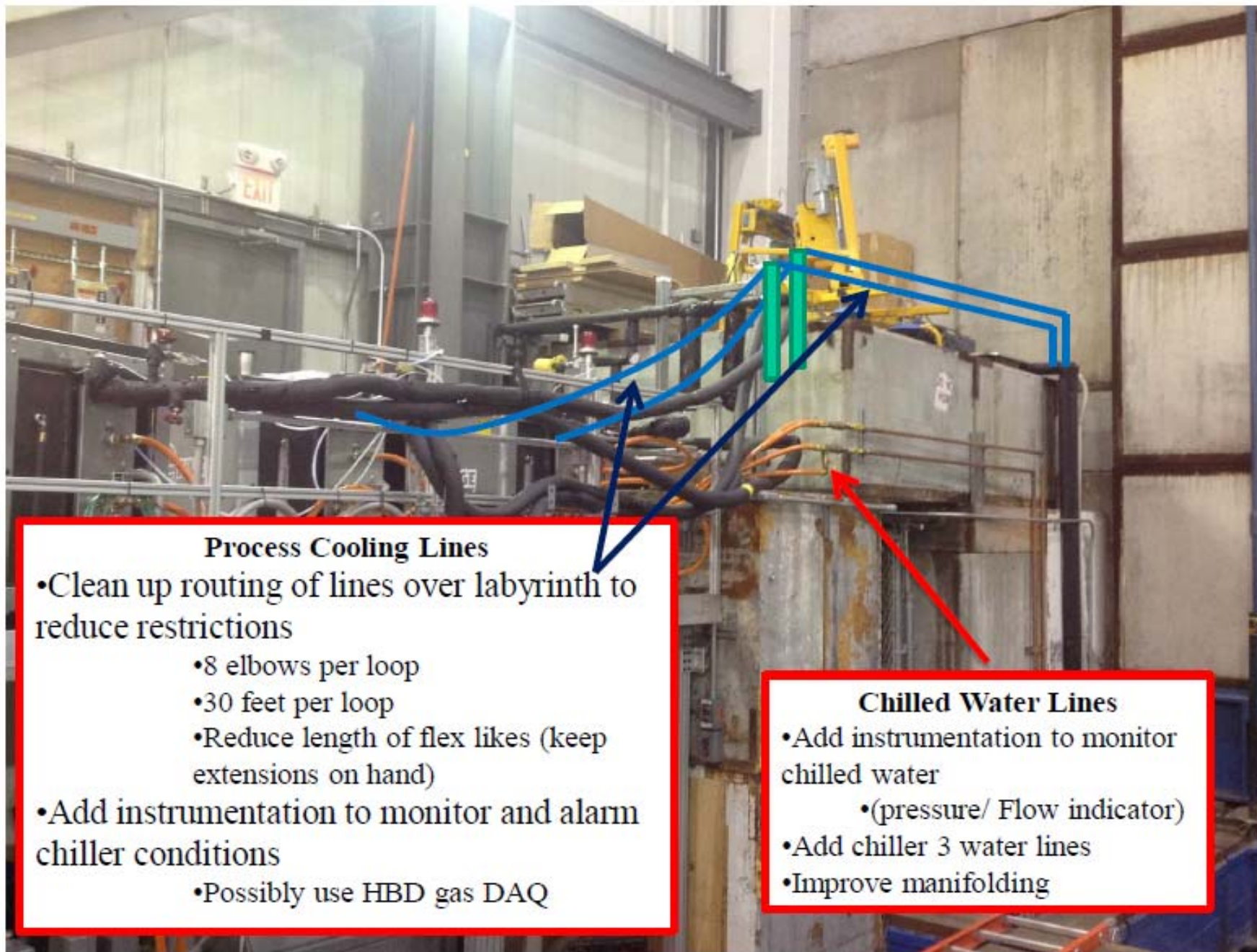
Procedures

All work described herein shall be coordinated and performed by PHENIX technicians and PHENIX cooling/gas system experts. In addition to standard training requirements (PHENIX Awareness and C-A User Training), all working personnel shall have appropriate skills and training to accomplish the work described herein. All workers shall have and wear the appropriate personal protective equipment (PPE) for each task.

1. All piping and fittings shall be thoroughly cleaned dried prior to installation. All cut segments of piping shall be thoroughly cleaned and deburred at the cut edges.
2. Piping shall be run as efficiently and directly as possible in accordance with the attached illustrations. (Worker planned work). Care shall be taken to locate piping so as to minimally interfere with access to and/or the operation, maintenance, testing, etc. of the RPC3 subsystem other systems and/or equipment. Piping shall be routed so as to preclude any creation of tripping hazards, inefficient use of space, intrusion into required clearances, etc.
3. After installation, piping shall be thoroughly leak tested.
4. Upon completion of installation all tools, consumable, materials, waste products, etc. shall be thoroughly cleaned from the site such that the site is restored to its pre-

installation state.

5. PHENIX cooling system experts shall install the operational components at the chillers and the detector and perform operational tests as appropriate to demonstrate specified operational characteristics.
6. Upon completion of this project, all work permit paperwork shall be completed, all unexpected problems and their solutions shall be recorded along with any other appropriate observations.



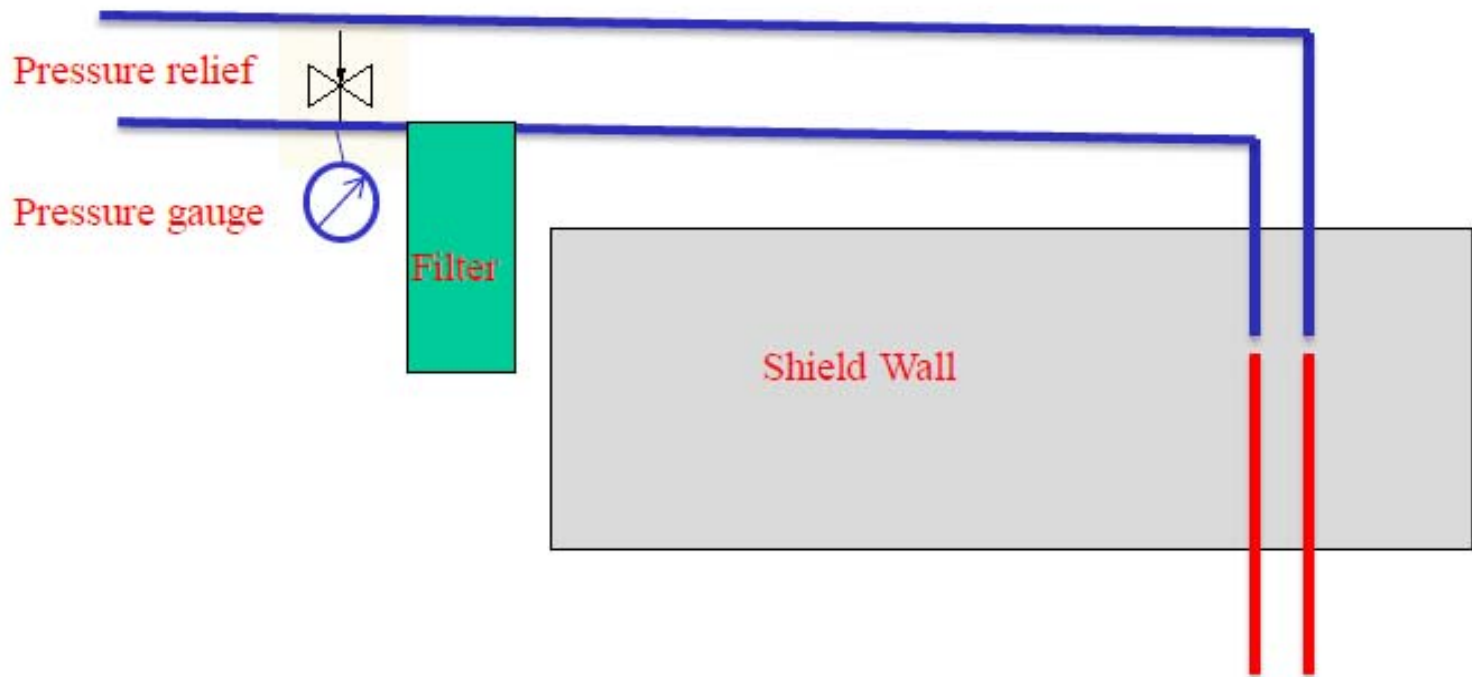
Process Cooling Lines

- Clean up routing of lines over labyrinth to reduce restrictions
 - 8 elbows per loop
 - 30 feet per loop
 - Reduce length of flex lines (keep extensions on hand)
- Add instrumentation to monitor and alarm chiller conditions
 - Possibly use HBD gas DAQ

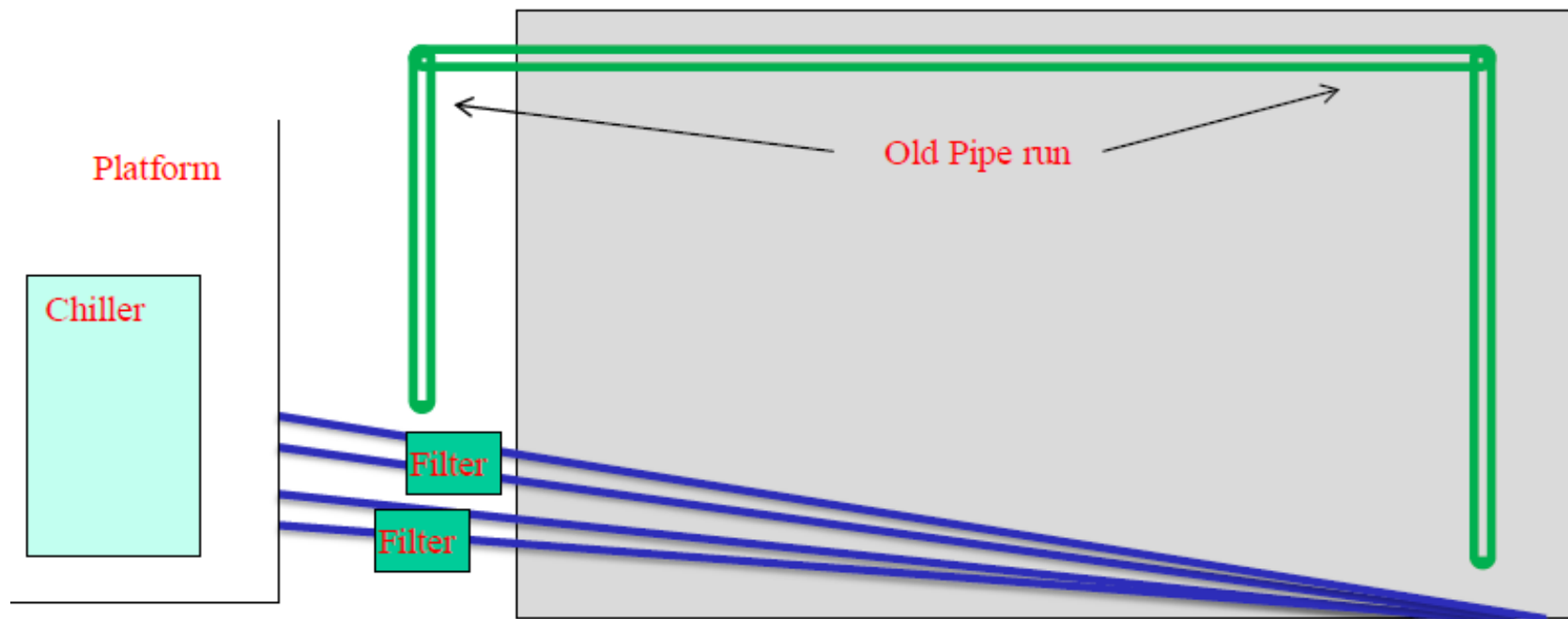
Chilled Water Lines

- Add instrumentation to monitor chilled water
 - (pressure/ Flow indicator)
- Add chiller 3 water lines
- Improve manifolding

Side view/ one loop shown



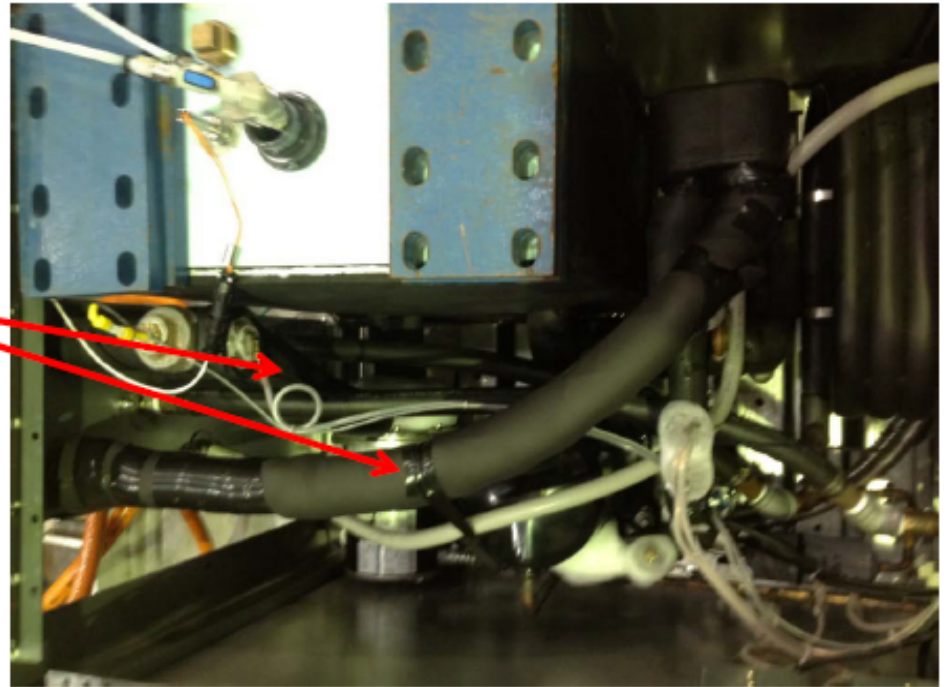
Top view



Replace nylon reinforced hose with stainless flex

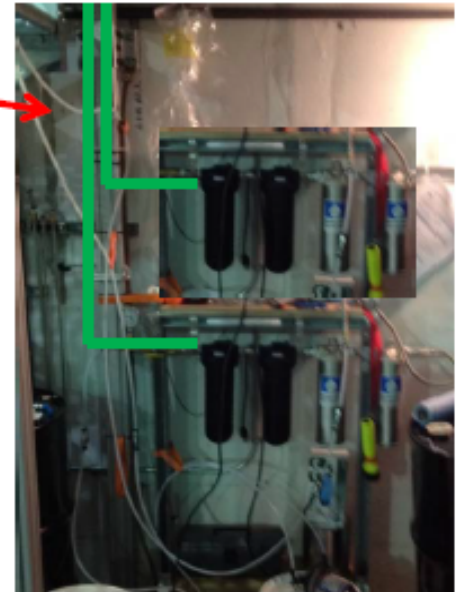
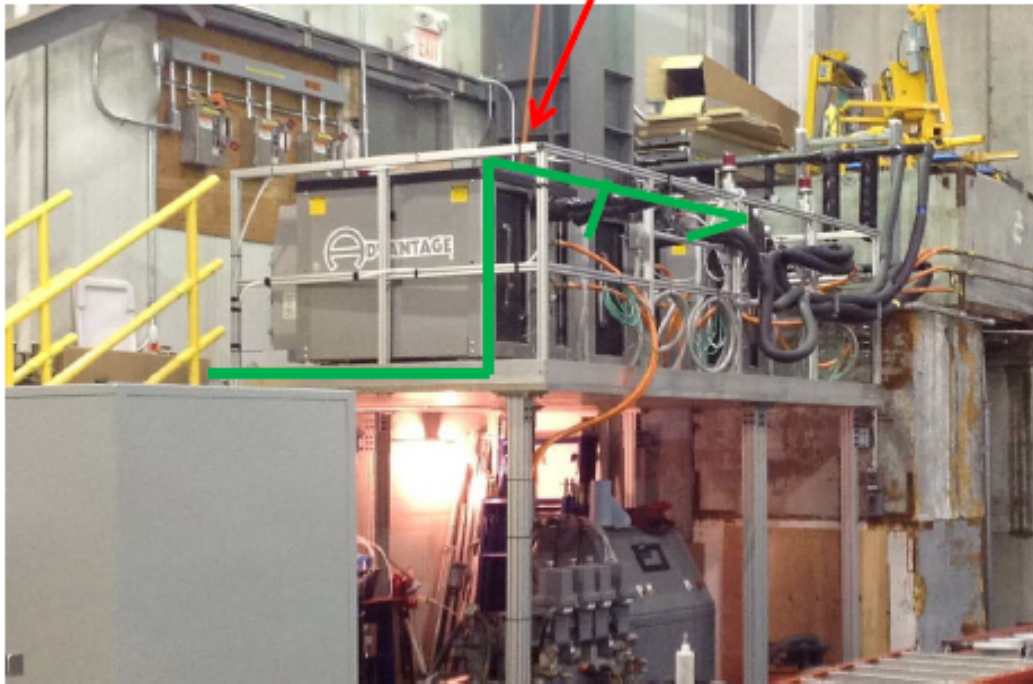
Chiller Work

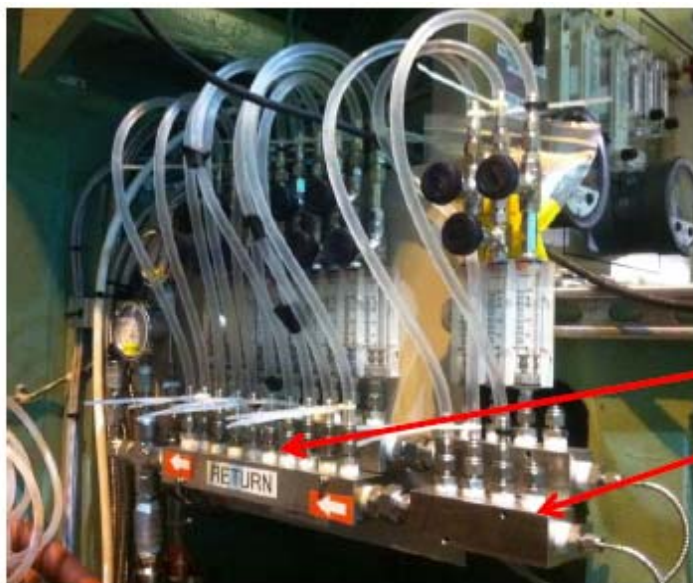
- Replace nylon reinforced hose with stainless flex (2 per Chiller)
- Bring in vendor to do maintenance on units



Upgrade Novec Cleaning System

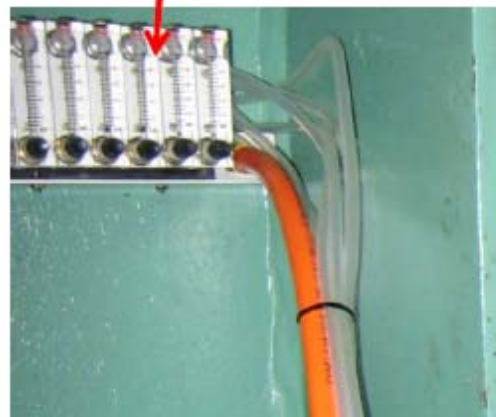
- Install filters for both loops
- Run insulated stainless lines from chillers to filters (DONE)





Manifolds in the IR

- Big Wheel/ Low temp chiller
 - Rebuild to increase size of manifold
 - make pixel lines permanent
- Low Temp (possible)
 - Split North FVTX feeds
 - Upgrade to $\frac{3}{4}$ " pipe from $\frac{1}{2}$ " where possible
 - Increase size of manifold to reduce restrictions
- Nitrogen
 - Add more lines for FVTX feeds



9/7/2012

Rob Pisani